UNIVERSITI TEKNOLOGI MARA

BIOMETRIC IDENTIFICATION AND RECOGNITION FOR IRIS USING FAILURE REJECTION RATE (FRR)

MUSAB A. M. ALI

Thesis submitted in fulfillment
of the requirement for the degree of
Doctor of Philosophy

Faculty of Electrical Engineering

January 2016

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research

Name of Student	:	Musab A. M. Ali
Student I.D. No.	:	2009797743
Programme	:	Doctor of Philosophy
Faculty	:	Faculty of Electrical Engineering
Thesis Tittle	:	Biometric Identification and Recognition for Iris Using Failure Rejection Rate (FRR)

Signature of Student : .....

Date : January 2016

CONFIRMATION BY PANEL OF EXAMINERS

I clarify that a Panel of Examiners has met on 19th June 2014 to conduct the final examination of Musab A. M. Ali on his Doctor of Philosophy thesis entitled "Biometric Identification and Recognition For Iris Using Failure Rejection Rate (FRR)" in accordance with Universiti Teknologi MARA Act 1976 (A kta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The panel of Examiners was as follows:

Norhashim Mohd Arshad, PhD
Senior Lecturer
Faculty of Kejuruteraan Elektrik
Universiti Teknologi MARA
(Internal Examiner)

Md Zaini Jamaludin, PhD
Professor
Faculty of Electronics & Communication Engineering.
Universiti Tenaga Nasional
(External Examiner)

Kim Yoon Sik, PhD
Professor
Faculty of Electrical Engineering
Korea Maritime University
(External Examiner)

SITI HALIJJAH SHARIFF, PhD
Associate Professor
Dean
Institute of Graduate Studies
Universiti Teknologi Mara
Date: 5 January 2016

ABSTRACT

Iris recognition is reckoned as one of the most reliable biometrics for identification purpose in terms of reliability and accuracy. Hence, the objectives of this research are new algorithms development significantly for iris segmentation specifically the proposed Fusion of Profile and Mask Technique (FPM) specifically in getting the actual center of the pupil with high level of accuracy prior to iris localization task, followed by a particular enhancement in iris normalization that is the application of quarter size of an iris image (instead of processing a whole or half size of an iris image) and for better precision and faster recognition with the robust Support Vector Machine (SVM) as classifier. Further aim of this research is the integration of cancelable biometrics feature in the proposed iris recognition technique via non-invertible transformation which determines the feature transformation-based template protection techniques security. Therefore, it is significant to formulate the non-invertibility measure to circumvent the possibility of adversary having the capability in guessing the original biometric providing that the transformed template is obtained. At any process of recognition stage, the biometric data is protected and also whenever there is a compromise to any information in the database it will be on the cancelable biometric template merely without affecting the original biometric information. In order to evaluate and verify the effectiveness of the proposed technique, CASIA-A (version 3.1) and Bath-A iris databases have been selected for performance testing. Briefly, the processes of the iris recognition system proposed in this research work are locating the pupil first via the novel technique that is the Fusion of Profile and Mask (FPM) Technique focusing on getting the actual center of the pupil then followed by localizing the actual iris region with the circular Hough transform. Next, select smaller yet optimal and effective normalized iris image size by applying different normalization factors. Instead of processing a whole or half size of an iris image, the 480 code size which is equivalent to the quarter size of an iris is selected due to its outstandingly accurate results and less computational complexity. The subsequent step is using the DAUB3 wavelet transform for feature extraction along with the application of an additional step for biometric template security that is the Non-invertible transform (cancelable biometrics method) and finally utilizing the Support Vector Machine (Non-linear Quadratic kernel) for matching/classification. The experimental results showed that the recognition rate achieved are of 99.9% on Bath-A data set, with a maximum decision criterion of 0.97.

TABLE OF CONTENTS